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Recent Tech-Transfer Activities of the GPC-platform

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One of the major challenges within biomedical imaging is to get precise and structured illumination of cells and cell regions. Furthermore, it is critical to illuminate with significant amount of light for high resolution imaging, while at the same time avoid too high intensity that may damage cells. In addition, to obtain the highest resolution, it is desired to illuminate with multiple wavelengths. For confocal microscopy, the inefficiency of light collecting makes users push the power limits of their lasers, or even buy more powerful lasers. In research, such as neurophotonics or optogenetics, structured light is used to trigger specific neuron locations for brain activity, whereas other locations should avoid illumination all together. Given the high price of advanced lasers and low throughput of sensors, efficient light shaping is needed in these applications. Furthermore, the use of two-photon excitation in optogenetics demands light excitation that is free of noise or speckles. The complex morphology of neuro-cell networks demands precise light illumination tools. However, researchers in the neuroscience field and equipment manufacturers are lacking a tool for analyzing brain functions. To emphasize the importance for brain research and subsequent need for advanced tools, the Obama government recently launched the BRAIN initiative ($300M per year) and EU launched the Human Brain Project (1.190B EUR). GPC is currently the only efficient phase-only light shaping that offers the well-known advantages of amplitude masking, i.e. speckle-free contiguous light distributions over a broad wavelength range. Light shaping methods used in homogenizers or engineered diffusers randomize the wavefront, defeating the purpose of using lasers. Beams shaped through diffractive techniques suffer from speckles and scale with wavelength. Furthermore, GPC easily forms arbitrary shapes without increasing the computing or fabrication overhead.

Technical background information can be found in below references:

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